

Recycler Injection Line Mirror Magnet Specifications

Meiqin Xaio, Jim Volk, Dave Johnson, Dan Broemmelsiek

Initial Constraints

The first dipole magnet in the Recycler SNuMI injection line could be mirrored with the PDD1 magnet to get the minimal beam separation required for the use of VUP1 switching magnet, Figure 1. The specification for PDD1 are:

- Magnetic Length: 2.4638m(8.0833ft)
- Dipole Field $B_0=2.312\text{kG}$.

This mirror dipole needs a 2"x4" aperture for the beam pipe. The figure below shows that there is 6.25" between the beam centers at the upstream location of the magnet labeled PDD1.

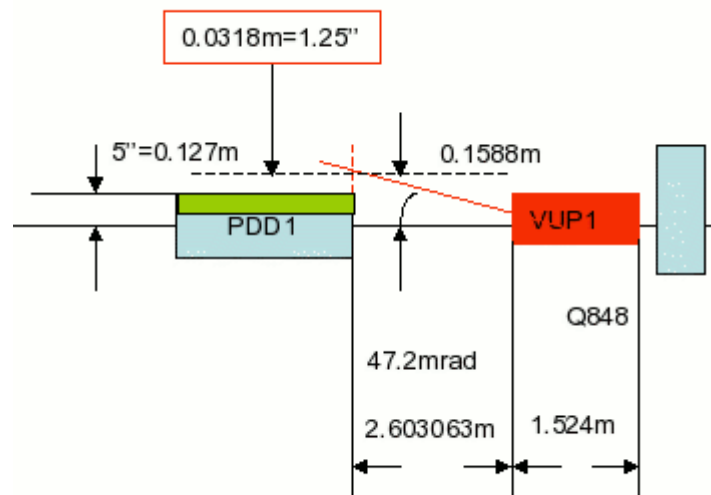


Figure 1: Diagram of switching magnet and first horizontal dipole bend in the MI8 to MI transfer line

Preliminary Design

The permanent magnet Lambertson design, Beams-doc-345-v1, is an example of an asymmetric magnet with a large dipole field strength. Figure 2 is a permanent magnet design with a 2"x4" beam pipe aperture and asymmetric pole tips to create a dipole strength of 2.167kG with 13 units of quad and 1 unit of sextapole. From the beam center line is located 3.25" above the bottom of the magnet. This is clearly a preliminary design and modifications to the transfer lines and/or magnet design are needed to address the higher order fields, magnet height and field strength.

Action Items

- Determine "flexibility" of transfer lines.
 - Can switcher magnet be moved upstream of quad?
 - How much beam separation at face of PDD1 is possible?

- Can length of mirror dipole be extended to get correct integrated field strength?
- How much can the bend center be moved without adversely affecting the existing transfer lines?
- Do field shaping in magnet design.
- Determine if beam center separation required by this design can be decreased without degradation of field strength.

